SECTION 02832 - SEGMENTAL RETAINING WALL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes:
1. Work includes furnishing and installing modular retaining wall units.
2. Included is furnishing and installing appurtenant materials required for construction of the retaining walls.

B. RELATED SECTIONS
1. Division 2 Section "Site Preparation."
2. Division 2 Section "Earthwork."

1.3 QUALITY ASSURANCE

A. REFERENCE STANDARDS
1. ASTM C 90 - Load Bearing Concrete Masonry Units.
2. ASTM C 140 - Sampling and Testing Concrete Units.
3. ASTM D 698 - Moisture Density Relationship for soils, Standard Method.
4. NCMA TEK 50 A - Specifications for Segmental Retaining Wall Units.
5. NCMA SRWU-1 - Determination of Connection Strength between Geosynthetics and Segmental Concrete Units.

6. NCMA SRWU-2 - Determination of Shear Strength between Segmental Concrete Units.
7. NCMA - Design Manual for Segmental Retaining Walls.

B. Where specifications and reference documents conflict, the Owner shall make the final determination of applicable document.

C. Certification: Contractor shall submit a notarized manufacturer's certification prior to start of work stating that the SRW units meet the requirements of this specification.

1.4 SUBMITTALS

A. Product Data: Manufacturer's printed product literature, including installation instructions.

B. Shop Drawings: Retaining wall system design including wall heights, geosynthetic reinforcement and drainage provisions.
1. Prepared and signed by a registered Professional Engineer retained by the Installer and licensed in the State of wall installation.

C. Samples:
1. Furnish one unit in the color and face pattern specified; approved unit may be used in the work.
2. 12 inches (300 mm) square or larger piece of geosynthetic reinforcing specified.

D. Test Reports: Submit test reports from an independent laboratory demonstrating compliance of concrete units with reference standards.
1. Water absorption and compressive strength tested in accordance with ASTM C 140, Sections 6,8, and 9.

1.5 DELIVERY, STORAGE AND HANDLING

A. Contractor shall check the materials upon delivery to assure that specified type, grade, color and texture of SRW units has been received.

B. Contractor shall prevent excessive mud, wet concrete, epoxies, and like materials which may affix themselves, from coming in contact with the materials.

C. Contractor shall protect the materials from damage. Damaged material shall not be incorporated into the reinforced soil wall.

PART 2 - MATERIALS

2.1 MODULAR RETAINING WALL UNITS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Keystone Retaining Wall Systems.
2. Versa-Lok Retaining Wall Systems (Kiltie Corporation).
3. Anchor Wall Systems.

B. Modular Concrete Retaining Wall Units: High strength, high density concrete units, freeze-thaw resistant.
1. Comply with ASTM C 90 except provide minimum compressive strength of 3000 psi (20 000 kPa) and a maximum water absorption of 7.0 percent.
2. Unit Height: Maximum height of 6 inches (150 mm) plus or minus 1/16 inch (1.5 mm).

3. Bond: Units shall be capable of being erected with a variable bond configuration. Bond should vary between 1/4 to 3/4 bond.
4. Face geometry: Straight.
5. Texture: Split face.
6. Color: As selected from the manufacturer's full product line.
7. All units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the construction. Cracking or excessive chipping may be grounds for rejection. Units showing cracks larger than 1/2" (13 mm) when measured along their length shall not be used within the wall. Units showing chips visible at a distance of 30 feet (9000 mm) from the wall shall not be used within the wall.

C. Units shall meet the following structural requirements:
1. The units shall be solid through the full depth of the unit.
2. For constructability considerations, the SRW units shall provide a minimum weight of 125 psf (600 kg/m) of wall face area.
3. Concrete used to manufacture SRW units shall have a minimum 28 days compressive strength of 3000 psi (20 000 kPa) in accordance with ASTM C 90 and C140. The concrete shall have adequate freeze/thaw protection with a maximum moisture absorption rate, by weight, of 8%. Compressive strength test specimens shall conform to the saw-cut coupon provisions of Section 5.2.4 of ASTM C140 with the following exception:
   a. Coupon shall be taken from the least dimension of the unit of a size and shape representing the geometry of the unit as a whole.

D. Units shall meet the following constructability and geometric requirements:
1. Units shall be capable of attaining concave and convex curves and 90 to 140 degrees inside corners and 25 to 90 degrees outside corners.
2. Units shall be positively engaged to the unit below with connection pins so as to provide a 3/4 - inch (20 mm) horizontal setback per 6-inch-(150 mm) high course (a cant of 7 degrees from vertical). The

installed wall cant shall not differ more than + or - 2 degrees from that specified.

2.2 RETAINING WALL UNIT CONNECTION PINS

A. Connection pins, which interlock the units, shall meet all manufacturer's specifications.

2.3 LEVELING PAD

A. Material for leveling pad shall consist of compacted sand or gravel and shall be a minimum of 6 inches (150 mm) in depth. The leveling pad should extend laterally at least a distance of 6 inches (150 mm) beyond the toe and heel of the lower most unit.

B. Do not run mechanical vibrating plate compactors on top of the units. Compact fill between units by running hand-operated compaction equipment just behind unit. Compact to minimum 95% Standard Proctor Density (ASTM D 698) or 90% of Modified Proctor Density (ASTM D 1557).

2.4 DRAINAGE AGGREGATE

A. Drainage fill material shall be the free draining gravel.
B. Vertical drainage layer behind the wall face shall be placed no less than 1 ft^3 per 1 ft^2 (0.03 m^3 per 0.1 m^2) of wall face.

2.5 RETAINED BACKFILL OR COMMON BACKFILL

A. Soil placed behind the reinforced backfill can be any inorganic soil with a liquid limit less than 50 and plasticity index less than 30, or as directed.

B. Retained backfill shall be compacted to a minimum 90% maximum Standard Proctor Density (ASTM 698).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which retaining walls are to be erected. Verify that layout dimensions are correct and substrate is in proper condition for installation.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 EXCAVATION

A. Contractor shall excavate to the lines and grades shown. Contractor shall take precautions to minimize over-excavation shall be filled with compacted infill material, or as directed, at the Contractor's expense.

B. Inspect the excavation prior to placement of leveling pad material.

C. Over-excavated areas in front of wall face shall be filled with compacted infill material at the Contractor's expense.

D. Contractor shall verify location of existing structures and utilities prior to excavation. Contractor shall ensure all surrounding structures are protected from the effects of wall excavation.

3.3 BASE LEVELING PAD

A. Leveling pad shall be placed as shown with a minimum thickness of 6 inches (150 mm). The leveling pad should extend laterally at least a distance of 6 inches (150 mm). The leveling pad should extend laterally at least a distance of 6 inches (150 mm). The leveling pad should extend laterally at least a distance of 6 inches (150 mm) from the toe and heel of the lower most unit.

B. Foundation soil shall be proofrolled and compacted to 95% Standard Proctor Density prior to placement of leveling pad materials.

C. Soil leveling pad material shall be compacted to provide a level hard surface on which to place the first course of units. Well-graded sand can be used to smooth the top ½ to ¼ inch (6 mm) of the leveling pad. Compaction will be with mechanical plate compactors to 95% of maximum Proctor density (ASTM D 698).

D. Leveling pad shall be prepared to ensure intimate contact of units with pad.

3.4 ERECTION

A. Erect units in accordance with the manufacturer's recommendations and as specified.

B. Place the first course on the prepared base material. Check units for level and alignment. Ensure that the top of all units in a course at are the same level.

C. Insure that units are in full contact with base.

D. Place the front of the units side-by-side. Do not leave gaps between the front of adjacent units. Alignment may be done by means of a string line or offset from base line to the back of the units or alone the pinning grooves. Lay out of curves and corners in accordance with SRW manufacturer's installation guidelines.

E. Place and compact drainage fill between and behind units. Place and compact infill soil behind drainage fill.

F. Clean all excess debris from top of units and install next course.

G. Insert two connection pins for each unit through pin holes of the upper course units into receiving slots in lower course units. Pins shall be fully seated in the pin slot below. Push units forward to remove any looseness in the unit-to-unit connection and then check alignment. Check level of the units.

H. Repeat procedures to the extent of the wall height, ensuring that pins are engaged in each successive course.

3.5 BACKFILL PLACEMENT

A. Place and compact backfill in lifts not to exceed 8 inches (200 mm).

B. Compact backfill to 95 percent of the maximum density as determined by ASTM D 689.

C. Place the top 8 inches (200 mm) of the fill using low permeability soil.

D. Only lightweight hand-operated equipment shall be allowed within 3 feet (900 mm) frm the tail of the modular units.

E. At the end of each day's operation, the Contractor shall slope the last lift of backfill away from the wall units to direct runoff away from the wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

3.6 CAP UNIT INSTALLATION

A. Apply construction adhesive to the top surface of the unit below and place the cap unit into the desired position. Caps shall overhang the top course of units.

B. Cut cap units if necessary to obtain the proper fit.

C. Backfill and compact to finish grade.

3.7 ADJUSTING AND CLEANING

A. Replace damaged units prior to Substantial Completion.

B. Remove debris and scrap from the site.

C. Leave adjacent paved areas broom clean.

END OF SECTION 02832